SEQUENCE LISTING

<110> Institute of Nutraceutical Research Pty Ltd

<120> Connective tissue derived polypeptides

<130> 119149/ROB

<150> AU2003903037
<151> 2003-06-17

<160> 19

<170> PatentIn version 3.1

<210> 1
<211> 187
<212> PRT
<213> Partial sequence of bovine NC4 domain of Type IX collagen alpha 1 chain

<400> 1

Pro Arg Phe Pro Val Asn Ser Asn Ser Asn Gly Glu Asn Glu Leu Cys
1 5 10 15

Pro Lys Val Arg Ile Gly Gln Asp Asp Leu Pro Gly Phe Asp Leu Ile
20 25 30

Ser Gln Phe Gln Ile Asp Lys Ala Ala Ser Arg Arg Ala Ile Gln Arg
35 40 45

Val Val Gly Ser Thr Ala Leu Gln Val Ala Tyr Lys Leu Gly Asn Asn
50 55 60

Val Asp Phe Arg Ile Pro Thr Arg His Leu Tyr Pro Asn Gly Leu Pro
65 70 75 80

Glu Glu Tyr Ser Phe Leu Thr Thr Phe Arg Met Thr Gly Ser Thr Leu
85 90 95

Glu Lys His Trp Ser Ile Trp Gln Ile Gln Asp Ser Ser Gly Lys Glu
100 105 110

Gln Val Gly Val Lys Ile Asn Gly Gln Thr Lys Ser Val Ser Phe Ser
115 120 125

Tyr Lys Gly Leu Asp Gly Ser Leu Gln Thr Ala Ala Phe Ser Asn Leu
130 135 140

Pro Ser Leu Phe Asp Ser Gln Trp His Lys Ile Met Ile Gly Val Glu
145 150 155 160

Arg Ser Ser Ala Thr Leu Phe Val Asp Cys Asn Arg Ile Glu Ser Leu
165 170 175

Pro Ile Lys Pro Arg Gly Gln Ile Asp Val Asp

180 185

<210> 2
<211> 9
<212> PRT
<213> Type IX collagen alpha 1 chain peptide

<400> 2

Lys Ser Val Ser Phe Ser Tyr Lys Gly
1 5

<210> 3
<211> 9
<212> PRT
<213> Type IX collagen alpha 1 chain peptide

<400> 3

Lys Ile Met Ile Gly Val Glu Arg Ser
1 5

<210> 4
<211> 10
<212> PRT
<213> Type IX collagen alpha 1 chain peptide

<400> 4

Lys Leu Gly Asn Asn Val Asp Phe Arg Ile
1 5 10

<210> 5
<211> 11
<212> PRT
<213> Type IX collagen alpha 1 chain peptide

<400> 5

Arg Ile Glu Ser Leu Pro Ile Lys Pro Arg Gly
1 5 10

<210> 6
<211> 15
<212> PRT
<213> Type IX collagen alpha 1 chain peptide

<400> 6

Lys His Trp Ser Ile Trp Gln Ile Gln Asp Ser Ser Gly Lys Glu
1 5 10 15

<210> 7
<211> 21
<212> PRT
<213> Type IX collagen alpha 1 chain peptide

<400> 7

Arg Ile Gly Gln Asp Asp Leu Pro Gly Phe Asp Leu Ile Ser Gln Phe
1 5 10 15

Gln Ile Asp Lys Ala
20

<210> 8
<211> 20
<212> PRT
<213> Type IX collagen alpha 1 chain peptide

<400> 8

Arg His Leu Tyr Pro Asn Gly Leu Pro Glu Glu Tyr Ser Phe Leu Thr
1 5 10 15

Thr Phe Arg Met
20

<210> 9
<211> 26
<212> PRT
<213> Type IX collagen alpha 1 chain peptide

<400> 9

Lys Gly Leu Asp Gly Ser Leu Gln Thr Ala Ala Phe Ser Asn Leu Pro
1 5 10 15

Ser Leu Phe Asp Ser Gln Trp His Lys Ile
20 25

<210> 10
<211> 9
<212> PRT
<213> Type IX collagen alpha 1 chain peptide

<400> 10

Lys Ile Met Ile Gly Val Glu Arg Ser
1 5

<210> 11
<211> 13
<212> PRT
<213> Type IX collagen alpha 1 chain peptide

<400> 11

Arg Ser Ser Ala Thr Leu Phe Val Asp Cys Asn Arg Ile
1 5 10

<210> 12
<211> 439
<212> PRT
<213> Cartilage oligomeric matrix protein [Fragment] - bovine

<400> 12

Asp Gly Val Leu Asn Glu Lys Asp Asn Cys Pro Leu Val Arg Asn Pro
1 5 10 15

Asp Gln Arg Asn Thr Asp Gly Asp Lys Trp Gly Asp Ala Cys Asp Asn
20 25 30

Cys Arg Ser Gln Lys Asn Asp Asp Gln Lys Asp Thr Asp Lys Asp Gly
35 40 45

Arg Gly Asp Ala Cys Asp Asp Asp Ile Asp Gly Asp Arg Ile Arg Asn
50 55 60

Pro Val Asp Asn Cys Pro Lys Val Pro Asn Ser Asp Gln Lys Asp Thr
65 70 75 80

Asp Gly Asp Gly Val Gly Asp Ala Cys Asp Asn Cys Pro Gln Lys Ser
85 90 95

Asn Ala Asp Gln Arg Asp Val Asp His Asp Phe Val Gly Asp Ala Cys
100 105 110

Asp Ser Asp Gln Asp Gln Asp Gly Asp Gly His Gln Asp Ser Lys Asp
115 120 125

Asn Cys Pro Thr Val Pro Asn Ser Ala Gln Gln Asp Ser Asp His Asp
130 135 140

Gly Gln Gly Asp Ala Cys Asp Asp Asp Asp Asp Asn Asp Gly Val Pro
145 150 155 160

Asp Ser Arg Asp Asn Cys Arg Leu Val Pro Asn Pro Gly Gln Glu Asp
165 170 175

Met Asp Arg Asp Gly Val Gly Asp Ala Cys Gln Gly Asp Phe Asp Ala
180 185 190

Asp Lys Val Val Asp Lys Ile Asp Val Cys Pro Glu Asn Ala Glu Val
195 200 205

Thr Leu Thr Asp Phe Arg Ala Phe Gln Thr Val Val Leu Asp Pro Glu
210 215 220

Gly Asp Ala Gln Ile Asp Pro Asn Trp Val Val Leu Asn Gln Gly Met
225 230 235 240

Glu Ile Val Gln Thr Met Asn Ser Asp Pro Gly Leu Cys Val Gly Tyr
245 250 255

Thr Ala Phe Asn Gly Val Asp Phe Glu Gly Pro Phe His Val Asn Thr
260 265 270

Ala Thr Asp Asp Asp Tyr Ala Gly Phe Ile Phe Gly Tyr His His Ser
275 280 285

Ser Ser Phe Tyr Val Val Met Trp Lys Gln Met Glu Gln Thr Tyr Trp
290 295 300

Gln Ala Asn Pro Phe Arg Ala Val Ala Glu Pro Gly Ile Gln Leu Lys
305 310 315 320

Ala Val Lys Ser Ser Thr Gly Pro Gly Glu Gln Leu Arg Asn Ala Leu
325 330 335

Trp His Thr Gly Asp Thr Ala Ser Gln Val Arg Leu Leu Trp Lys Asp
340 345 350

Pro Arg Asn Val Gly Trp Lys Asp Lys Thr Ser Tyr Arg Trp Phe Leu
355 360 365

Gln His Arg Pro Gln Val Gly Tyr Ile Arg Val Arg Phe Tyr Glu Gly
370 375 380

Pro Glu Leu Val Ala Asp Ser Asn Val Ile Leu Asp Thr Thr Met Arg
385 390 395 400

Gly Gly Arg Leu Gly Val Phe Cys Phe Ser Gln Glu Asn Ile Ile Trp
405 410 415

Ala Asn Leu Arg Tyr Arg Cys Asn Asp Thr Ile Pro Glu Asp Tyr Glu
420 425 430

Ala Gln Arg Leu Leu Gln Ala
435

<210> 13
<211> 159
<212> PRT
<213> Odorant-binding protein - bovine

<400> 13

Ala Gln Glu Glu Glu Ala Glu Gln Asn Leu Ser Glu Leu Ser Gly Pro
1 5 10 15

Trp Arg Thr Val Tyr Ile Gly Ser Thr Asn Pro Glu Lys Ile Gln Glu
20 25 30

Asn Gly Pro Phe Arg Thr Tyr Phe Arg Glu Leu Val Phe Asp Asp Glu
35 40 45

Lys Gly Thr Val Asp Phe Tyr Phe Ser Val Lys Arg Asp Gly Lys Trp
50 55 60

Lys Asn Val His Val Lys Ala Thr Lys Gln Asp Asp Gly Thr Tyr Val
65 70 75 80

Ala Asp Tyr Glu Gly Gln Asn Val Phe Lys Ile Val Ser Leu Ser Arg

85 90 95

Thr His Leu Val Ala His Asn Ile Asn Val Asp Lys His Gly Gln Thr
100 105 110

Thr Glu Leu Thr Glu Leu Phe Val Lys Leu Asn Val Glu Asp Glu Asp
115 120 125

Leu Glu Lys Phe Trp Lys Leu Thr Glu Asp Lys Gly Ile Asp Lys Lys
130 135 140

Asn Val Val Asn Phe Leu Glu Asn Glu Asp His Pro His Pro Glu
145 150 155

<210> 14
<211> 245
<212> PRT
<213> human collagen type IX NC4 domain

<400> 14

Ala Val Lys Arg Arg Pro Arg Phe Pro Val Asn Ser Asn Ser Asn Gly
1 5 10 15

Gly Asn Glu Leu Cys Pro Lys Ile Arg Ile Gly Gln Asp Asp Leu Pro
20 25 30

Gly Phe Asp Leu Ile Ser Gln Phe Gln Val Asp Lys Ala Ala Ser Arg
35 40 45

Arg Ala Ile Gln Arg Val Val Gly Ser Ala Thr Leu Gln Val Ala Tyr
50 55 60

Lys Leu Gly Asn Asn Val Asp Phe Arg Ile Pro Thr Arg Asn Leu Tyr
65 70 75 80

Pro Ser Gly Leu Pro Glu Glu Tyr Ser Phe Leu Thr Thr Phe Arg Met
85 90 95

Thr Gly Ser Thr Leu Lys Lys Asn Trp Asn Ile Trp Gln Ile Gln Asp
100 105 110

Ser Ser Gly Lys Glu Gln Val Gly Ile Lys Ile Asn Gly Gln Thr Gln
115 120 125

Ser Val Val Phe Ser Tyr Lys Gly Leu Asp Gly Ser Leu Gln Thr Ala
130 135 140

Ala Phe Ser Asn Leu Ser Ser Leu Phe Asp Ser Gln Trp His Lys Ile
145 150 155 160

Met Ile Gly Val Glu Arg Ser Ser Ala Thr Leu Phe Val Asp Cys Asn
165 170 175

Arg Ile Glu Ser Leu Pro Ile Lys Pro Arg Gly Pro Ile Asp Ile Asp
180 185 190

Gly Phe Ala Val Leu Gly Lys Leu Ala Asp Asn Pro Gln Val Ser Val
195 200 205

Pro Phe Glu Leu Gln Trp Met Leu Ile His Cys Asp Pro Leu Arg Pro
210 215 220

Arg Arg Glu Thr Cys His Glu Leu Pro Ala Arg Ile Thr Pro Ser Gln
225 230 235 240

Thr Thr Asp Glu Arg
245

<210> 15
<211> 921
<212> PRT
<213> human alpha (IX) chain precursor

<400> 15

Met Lys Thr Cys Trp Lys Ile Pro Val Phe Phe Phe Val Cys Ser Phe
1 5 10 15

Leu Glu Pro Trp Ala Ser Ala Ala Val Lys Arg Arg Pro Arg Phe Pro
20 25 30

Val Asn Ser Asn Ser Asn Gly Gly Asn Glu Leu Cys Pro Lys Ile Arg
35 40 45

Ile Gly Gln Asp Asp Leu Pro Gly Phe Asp Leu Ile Ser Gln Phe Gln
50 55 60

Val Asp Lys Ala Ala Ser Arg Arg Ala Ile Gln Arg Val Val Gly Ser
65 70 75 80

Ala Thr Leu Gln Val Ala Tyr Lys Leu Gly Asn Asn Val Asp Phe Arg
85 90 95

Ile Pro Thr Arg Asn Leu Tyr Pro Ser Gly Leu Pro Glu Glu Tyr Ser
100 105 110

Phe Leu Thr Thr Phe Arg Met Thr Gly Ser Thr Leu Lys Lys Asn Trp
115 120 125

Asn Ile Trp Gln Ile Gln Asp Ser Ser Gly Lys Glu Gln Val Gly Ile
130 135 140

Lys Ile Asn Gly Gln Thr Gln Ser Val Val Phe Ser Tyr Lys Gly Leu
145 150 155 160

```
Asp Gly Ser Leu Gln Thr Ala Ala Phe Ser Asn Leu Ser Ser Leu Phe
                165                 170                 175

Asp Ser Gln Trp His Lys Ile Met Ile Gly Val Glu Arg Ser Ser Ala
            180                 185                 190

Thr Leu Phe Val Asp Cys Asn Arg Ile Glu Ser Leu Pro Ile Lys Pro
        195                 200                 205

Arg Gly Pro Ile Asp Ile Asp Gly Phe Ala Val Leu Gly Lys Leu Ala
    210                 215                 220

Asp Asn Pro Gln Val Ser Val Pro Phe Glu Leu Gln Trp Met Leu Ile
225                 230                 235                 240

His Cys Asp Pro Leu Arg Pro Arg Arg Glu Thr Cys His Glu Leu Pro
                245                 250                 255

Ala Arg Ile Thr Pro Ser Gln Thr Thr Asp Glu Arg Gly Pro Pro Gly
            260                 265                 270

Glu Gln Gly Pro Pro Gly Pro Pro Gly Pro Pro Gly Val Pro Gly Ile
        275                 280                 285

Asp Gly Ile Asp Gly Asp Arg Gly Pro Lys Gly Pro Pro Gly Pro Pro
    290                 295                 300

Gly Pro Ala Gly Glu Pro Gly Lys Pro Gly Ala Pro Gly Lys Pro Gly
305                 310                 315                 320

Thr Pro Gly Ala Asp Gly Leu Thr Gly Pro Asp Gly Ser Pro Gly Ser
                325                 330                 335

Ile Gly Ser Lys Gly Gln Lys Gly Glu Pro Gly Val Pro Gly Ser Arg
            340                 345                 350

Gly Phe Pro Gly Arg Gly Ile Pro Gly Pro Pro Gly Pro Pro Gly Thr
        355                 360                 365

Ala Gly Leu Pro Gly Glu Leu Gly Arg Val Gly Pro Val Gly Asp Pro
    370                 375                 380

Gly Arg Arg Gly Pro Pro Gly Pro Pro Gly Pro Pro Gly Pro Arg Gly
385                 390                 395                 400

Thr Ile Gly Phe His Asp Gly Asp Pro Leu Cys Pro Asn Ala Cys Pro
                405                 410                 415

Pro Gly Arg Ser Gly Tyr Pro Gly Leu Pro Gly Met Arg Gly His Lys
            420                 425                 430
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Gly Ala Lys Gly Glu Ile Gly Glu Pro Gly Arg Gln Gly His Lys Gly
435 440 445

Glu Glu Gly Asp Gln Gly Glu Leu Gly Glu Val Gly Ala Gln Gly Pro
450 455 460

Pro Gly Ala Gln Gly Leu Arg Gly Ile Thr Gly Ile Val Gly Asp Lys
465 470 475 480

Gly Glu Lys Gly Ala Arg Gly Leu Asp Gly Glu Pro Gly Pro Gln Gly
485 490 495

Leu Pro Gly Ala Pro Gly Asp Gln Gly Gln Arg Gly Pro Pro Gly Glu
500 505 510

Ala Gly Pro Lys Gly Asp Arg Gly Ala Glu Gly Ala Arg Gly Ile Pro
515 520 525

Gly Leu Pro Gly Pro Lys Gly Asp Thr Gly Leu Pro Gly Val Asp Gly
530 535 540

Arg Asp Gly Ile Pro Gly Met Pro Gly Thr Lys Gly Glu Pro Gly Lys
545 550 555 560

Pro Gly Pro Pro Gly Asp Ala Gly Leu Gln Gly Leu Pro Gly Val Pro
565 570 575

Gly Ile Pro Gly Ala Lys Gly Val Ala Gly Glu Lys Gly Ser Thr Gly
580 585 590

Ala Pro Gly Lys Pro Gly Gln Met Gly Asn Ser Gly Lys Pro Gly Gln
595 600 605

Gln Gly Pro Pro Gly Glu Val Gly Pro Arg Gly Pro Gln Gly Leu Pro
610 615 620

Gly Ser Arg Gly Glu Leu Gly Pro Val Gly Ser Pro Gly Leu Pro Gly
625 630 635 640

Lys Leu Gly Ser Leu Gly Ser Pro Gly Leu Pro Gly Leu Pro Gly Pro
645 650 655

Pro Gly Leu Pro Gly Met Lys Gly Asp Arg Gly Val Val Gly Glu Pro
660 665 670

Gly Pro Lys Gly Glu Gln Gly Ala Ser Gly Glu Glu Gly Glu Ala Gly
675 680 685

Glu Arg Gly Glu Leu Gly Asp Ile Gly Leu Pro Gly Pro Lys Gly Ser
690 695 700

Ala Gly Asn Pro Gly Glu Pro Gly Leu Arg Gly Pro Glu Gly Ser Arg
705 710 715 720

Gly Leu Pro Gly Val Glu Gly Pro Arg Gly Pro Pro Gly Pro Arg Gly
725 730 735

Val Gln Gly Glu Gln Gly Ala Thr Gly Leu Pro Gly Val Gln Gly Pro
740 745 750

Pro Gly Arg Ala Pro Thr Asp Gln His Ile Lys Gln Val Cys Met Arg
755 760 765

Val Ile Gln Glu His Phe Ala Glu Met Ala Ala Ser Leu Lys Arg Pro
770 775 780

Asp Ser Gly Ala Thr Gly Leu Pro Gly Arg Pro Gly Pro Pro Gly Pro
785 790 795 800

Pro Gly Pro Pro Gly Glu Asn Gly Phe Pro Gly Gln Met Gly Ile Arg
805 810 815

Gly Leu Pro Gly Ile Lys Gly Pro Pro Gly Ala Leu Gly Leu Arg Gly
820 825 830

Pro Lys Gly Asp Leu Gly Glu Lys Gly Glu Arg Gly Pro Pro Gly Arg
835 840 845

Gly Pro Asn Gly Leu Pro Gly Ala Ile Gly Leu Pro Gly Asp Pro Gly
850 855 860

Pro Ala Ser Tyr Gly Lys Asn Gly Arg Asp Gly Glu Arg Gly Pro Pro
865 870 875 880

Gly Leu Ala Gly Ile Pro Gly Val Pro Gly Pro Pro Gly Pro Pro Gly
885 890 895

Leu Pro Gly Phe Cys Glu Pro Ala Ser Cys Thr Met Gln Ala Gly Gln
900 905 910

Arg Ala Phe Asn Lys Gly Pro Asp Pro
915 920

<210> 16
<211> 243
<212> PRT
<213> chicken collagen type IX NC4 domain

<400> 16

Thr Tyr Gln Gln Gln Ser Arg Leu Pro Val Ile Leu Gly Ala Arg Gln
1 5 10 15

Arg Thr Asp Leu Cys Pro Thr Ile Arg Ile Gly Glu Asp Asp Leu Pro
20 25 30

Gly Phe Asp Leu Ile Ser Gln Phe Gln Ile Glu Lys Ala Ala Ser Gln
35 40 45

Gly Ile Val Gln Arg Val Val Gly Ser Thr Ala Leu Gln Val Ala Tyr
50 55 60

Lys Leu Gly Pro Asn Val Asp Phe Arg Ile Pro Thr Ser Ala Ile Tyr
65 70 75 80

Ser Asn Gly Leu Pro Asp Glu Tyr Ser Phe Leu Thr Thr Phe Arg Met
85 90 95

Thr Gly Ala Thr Leu Gln Lys Tyr Trp Thr Ile Trp Gln Ile Gln Asp
100 105 110

Ser Ser Gly Lys Glu Gln Val Gly Val Asn Leu Asn Gly Pro Met Lys
115 120 125

Ser Val Glu Phe Ser Tyr Lys Gly Val Asp Gly Ser Leu Gln Thr Ala
130 135 140

Ser Phe Leu His Leu Pro Phe Leu Phe Asp Ser Gln Trp His Lys Leu
145 150 155 160

Met Ile Ser Val Glu Thr Thr Ser Val Thr Leu Phe Ile Asp Cys Ile
165 170 175

Lys Val Glu Thr Leu Asn Ile Lys Pro Lys Gly Lys Ile Ser Val Asp
180 185 190

Gly Phe Ser Val Leu Gly Arg Leu Lys Asn Asn Pro Gln Ile Ser Val
195 200 205

Pro Phe Glu Val Gln Trp Met Pro Ile His Cys Asp Pro Leu Arg Pro
210 215 220

Gln Arg Glu Gly Cys Gly Glu Leu Pro Ala Arg Ile Ser Gln Thr Val
225 230 235 240

Ile Glu Arg

<210> 17
<211> 503
<212> PRT
<213> chicken alpha (IX) chain precursor

<400> 17

Met Lys Ser Asn Trp Lys Ile Thr Ala Phe Leu Tyr Met Cys Ser Phe

1 5 10 15

Leu Gly Ser Phe Ile Ser Ala Thr Tyr Gln Gln Gln Ser Arg Leu Pro
20 25 30

Val Ile Leu Gly Ala Arg Gln Arg Thr Asp Leu Cys Pro Thr Ile Arg
35 40 45

Ile Gly Glu Asp Asp Leu Pro Gly Phe Asp Leu Ile Ser Gln Phe Gln
50 55 60

Ile Glu Lys Ala Ala Ser Gln Gly Ile Val Gln Arg Val Val Gly Ser
65 70 75 80

Thr Ala Leu Gln Val Ala Tyr Lys Leu Gly Pro Asn Val Asp Phe Arg
85 90 95

Ile Pro Thr Ser Ala Ile Tyr Ser Asn Gly Leu Pro Asp Glu Tyr Ser
100 105 110

Phe Leu Thr Thr Phe Arg Met Thr Gly Ala Thr Leu Gln Lys Tyr Trp
115 120 125

Thr Ile Trp Gln Ile Gln Asp Ser Ser Gly Lys Glu Gln Val Gly Val
130 135 140

Asn Leu Asn Gly Pro Met Lys Ser Val Glu Phe Ser Tyr Lys Gly Val
145 150 155 160

Asp Gly Ser Leu Gln Thr Ala Ser Phe Leu His Leu Pro Phe Leu Phe
165 170 175

Asp Ser Gln Trp His Lys Leu Met Ile Ser Val Glu Thr Thr Ser Val
180 185 190

Thr Leu Phe Ile Asp Cys Ile Lys Val Glu Thr Leu Asn Ile Lys Pro
195 200 205

Lys Gly Lys Ile Ser Val Asp Gly Phe Ser Val Leu Gly Arg Leu Lys
210 215 220

Asn Asn Pro Gln Ile Ser Val Pro Phe Glu Val Gln Trp Met Pro Ile
225 230 235 240

His Cys Asp Pro Leu Arg Pro Gln Arg Glu Gly Cys Gly Glu Leu Pro
245 250 255

Ala Arg Ile Ser Gln Thr Val Ile Glu Arg Gly Leu Pro Gly Pro Pro
260 265 270

Gly Pro Pro Gly Pro Pro Gly Pro Pro Gly Val Pro Gly Ile Asp Gly

275 280 285

Ile Asp Gly Glu Arg Gly Pro Asn Gly Pro Pro Gly Pro Pro Gly Pro
290 295 300

Asp Gly Asp Ala Gly Lys Ala Gly Ser Pro Gly Leu Pro Gly Glu Pro
305 310 315 320

Gly Ala Asp Gly Leu Thr Gly Pro Asp Gly Ser Pro Gly Ala Thr Gly
325 330 335

Pro Lys Gly Gln Lys Gly Glu Pro Gly Pro Pro Gly Ala Arg Gly Leu
340 345 350

Pro Gly Lys Gly Leu Leu Gly Pro Pro Gly Pro Ala Gly Ala Ala Gly
355 360 365

Leu Pro Gly Glu Val Gly Arg Ala Gly Pro Pro Gly Asp Pro Gly Lys
370 375 380

Arg Gly Pro Pro Gly Pro Pro Gly Pro Pro Gly Pro Arg Gly Thr Ile
385 390 395 400

Gly Leu Gln Asp Gly Asp Pro Leu Cys Pro Asn Ala Cys Pro Pro Gly
405 410 415

Glu Ala Gly Glu Arg Gly Glu Arg Gly Phe Pro Gly Arg Gly Val Lys
420 425 430

Gly Leu Pro Gly Pro Arg Gly Leu Pro Gly Glu Pro Gly Lys Pro Ser
435 440 445

Tyr Gly Arg Glu Gly Arg Asp Gly Val Arg Gly Pro Pro Gly Val Ala
450 455 460

Gly Gln Pro Gly Ile Pro Gly Pro Pro Gly Pro Pro Gly Pro Pro Gly
465 470 475 480

Tyr Cys Glu Pro Ser Ser Cys Arg Met Gln Ala Gly Gln Arg Ala Ala
485 490 495

Gly Lys Asn Met Lys Gly Pro
500

<210> 18
<211> 245
<212> PRT
<213> mouse collagen type IX NC4 domain

<400> 18

Thr Leu Lys Arg Arg Ala Arg Phe Pro Ala Asn Ser Ile Ser Asn Gly
1 5 10 15

Gly Ser Glu Leu Cys Pro Lys Ile Arg Ile Gly Gln Asp Asp Leu Pro
20 25 30

Gly Phe Asp Leu Ile Ser Gln Phe Gln Ile Glu Lys Ala Ala Ser Arg
35 40 45

Arg Thr Ile Gln Arg Val Val Gly Ser Thr Ala Leu Gln Val Ala Tyr
50 55 60

Lys Leu Gly Ser Asn Val Asp Phe Arg Ile Pro Thr Arg His Leu Tyr
65 70 75 80

Pro Ser Gly Leu Pro Glu Glu Tyr Ser Phe Leu Thr Thr Phe Arg Met
85 90 95

Thr Gly Ser Thr Leu Glu Lys His Trp Asn Ile Trp Gln Ile Gln Asp
100 105 110

Ser Ala Gly Arg Glu Gln Val Gly Val Lys Ile Asn Gly Gln Thr Lys
115 120 125

Ser Val Ala Phe Ser Tyr Lys Gly Leu Asp Gly Ser Leu Gln Thr Ala
130 135 140

Ala Phe Leu Asn Leu Pro Ser Leu Phe Asp Ser Arg Trp His Lys Leu
145 150 155 160

Met Ile Gly Val Glu Arg Thr Ser Ala Thr Leu Phe Ile Asp Cys Ile
165 170 175

Arg Ile Glu Ser Leu Pro Ile Lys Pro Arg Gly Gln Ile Asp Ala Asp
180 185 190

Gly Phe Ala Val Leu Gly Lys Leu Val Asp Asn Pro Gln Val Ser Val
195 200 205

Pro Phe Glu Leu Gln Trp Met Leu Ile His Cys Asp Pro Leu Arg Pro
210 215 220

Arg Arg Glu Thr Cys His Glu Leu Pro Ile Arg Ile Thr Thr Ser Gln
225 230 235 240

Thr Thr Asp Glu Arg
245

<210> 19
<211> 921
<212> PRT
<213> mouse alpha (IX) chain precursor

<400> 19

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Met Lys Asn Phe Trp Lys Ile Ser Val Phe Phe Cys Val Cys Ser Cys
1               5                  10                  15

Leu Gly Pro Trp Val Ser Ala Thr Leu Lys Arg Arg Ala Arg Phe Pro
            20                  25                  30

Ala Asn Ser Ile Ser Asn Gly Gly Ser Glu Leu Cys Pro Lys Ile Arg
        35                  40                  45

Ile Gly Gln Asp Asp Leu Pro Gly Phe Asp Leu Ile Ser Gln Phe Gln
    50                  55                  60

Ile Glu Lys Ala Ala Ser Arg Arg Thr Ile Gln Arg Val Val Gly Ser
65                  70                  75                  80

Thr Ala Leu Gln Val Ala Tyr Lys Leu Gly Ser Asn Val Asp Phe Arg
                85                  90                  95

Ile Pro Thr Arg His Leu Tyr Pro Ser Gly Leu Pro Glu Glu Tyr Ser
            100                 105                 110

Phe Leu Thr Thr Phe Arg Met Thr Gly Ser Thr Leu Glu Lys His Trp
        115                 120                 125

Asn Ile Trp Gln Ile Gln Asp Ser Ala Gly Arg Glu Gln Val Gly Val
    130                 135                 140

Lys Ile Asn Gly Gln Thr Lys Ser Val Ala Phe Ser Tyr Lys Gly Leu
145                 150                 155                 160

Asp Gly Ser Leu Gln Thr Ala Ala Phe Leu Asn Leu Pro Ser Leu Phe
                165                 170                 175

Asp Ser Arg Trp His Lys Leu Met Ile Gly Val Glu Arg Thr Ser Ala
            180                 185                 190

Thr Leu Phe Ile Asp Cys Ile Arg Ile Glu Ser Leu Pro Ile Lys Pro
        195                 200                 205

Arg Gly Gln Ile Asp Ala Asp Gly Phe Ala Val Leu Gly Lys Leu Val
    210                 215                 220

Asp Asn Pro Gln Val Ser Val Pro Phe Glu Leu Gln Trp Met Leu Ile
225                 230                 235                 240

His Cys Asp Pro Leu Arg Pro Arg Arg Glu Thr Cys His Glu Leu Pro
                245                 250                 255

Ile Arg Ile Thr Thr Ser Gln Thr Thr Asp Glu Arg Gly Pro Pro Gly
            260                 265                 270
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```
Glu Gln Gly Pro Pro Gly Pro Pro Gly Pro Pro Gly Val Pro Gly Ile
        275                 280                 285

Asp Gly Ile Asp Gly Asp Arg Gly Pro Lys Gly Pro Pro Gly Pro Pro
    290                 295                 300

Gly Pro Pro Gly Asp Pro Gly Lys Pro Gly Ala Pro Gly Lys Pro Gly
305                 310                 315                 320

Thr Pro Gly Ala Asp Gly Leu Thr Gly Pro Asp Gly Ser Pro Gly Ser
                325                 330                 335

Val Gly Pro Arg Gly Gln Lys Gly Glu Pro Gly Val Pro Gly Ser Arg
            340                 345                 350

Gly Phe Pro Gly Arg Gly Ile Pro Gly Pro Pro Gly Pro Pro Gly Thr
        355                 360                 365

Thr Gly Leu Pro Gly Glu Leu Gly Arg Val Gly Pro Ile Gly Asp Pro
    370                 375                 380

Gly Lys Arg Gly Pro Pro Gly Pro Pro Gly Pro Pro Gly Pro Ser Gly
385                 390                 395                 400

Thr Ile Gly Phe His Asp Gly Asp Pro Leu Cys Pro Asn Ser Cys Pro
                405                 410                 415

Pro Gly Arg Ser Gly Tyr Pro Gly Leu Pro Gly Met Arg Gly His Lys
            420                 425                 430

Gly Ala Lys Gly Glu Ile Gly Glu Pro Gly Arg Gln Gly His Lys Gly
        435                 440                 445

Glu Glu Gly Asp Gln Gly Glu Leu Gly Glu Val Gly Ala Gln Gly Pro
    450                 455                 460

Pro Gly Pro Gln Gly Leu Arg Gly Ile Thr Gly Ile Val Gly Asp Lys
465                 470                 475                 480

Gly Glu Lys Gly Ala Arg Gly Phe Asp Gly Glu Pro Gly Pro Gln Gly
                485                 490                 495

Ile Pro Gly Ala Ala Gly Asp Gln Gly Gln Arg Gly Pro Pro Gly Glu
            500                 505                 510

Thr Gly Pro Lys Gly Asp Arg Gly Ile Gln Gly Ser Arg Gly Ile Pro
        515                 520                 525

Gly Ser Pro Gly Pro Lys Gly Asp Thr Gly Leu Pro Gly Val Asp Gly
    530                 535                 540
```

Arg Asp Gly Ile Pro Gly Met Pro Gly Thr Lys Gly Glu Ala Gly Lys
545 550 555 560

Pro Gly Pro Pro Gly Asp Val Gly Leu Gln Gly Leu Pro Gly Val Pro
565 570 575

Gly Ile Pro Gly Ala Lys Gly Val Ala Gly Glu Lys Gly Asn Thr Gly
580 585 590

Ala Pro Gly Lys Pro Gly Gln Leu Gly Ser Ser Gly Lys Pro Gly Gln
595 600 605

Gln Gly Pro Pro Gly Glu Val Gly Pro Arg Gly Pro Arg Gly Leu Pro
610 615 620

Gly Ser Arg Gly Pro Val Gly Pro Glu Gly Ser Pro Gly Ile Pro Gly
625 630 635 640

Lys Leu Gly Ser Val Gly Ser Pro Gly Leu Pro Gly Leu Pro Gly Pro
645 650 655

Pro Gly Leu Pro Gly Met Lys Gly Asp Arg Gly Val Phe Gly Glu Pro
660 665 670

Gly Pro Lys Gly Glu Gln Gly Ala Ser Gly Glu Glu Gly Glu Ala Gly
675 680 685

Ala Arg Gly Asp Leu Gly Asp Met Gly Gln Pro Gly Pro Lys Gly Ser
690 695 700

Val Gly Asn Pro Gly Glu Pro Gly Leu Arg Gly Pro Glu Gly Ile Arg
705 710 715 720

Gly Leu Pro Gly Val Glu Gly Pro Arg Gly Pro Pro Gly Pro Arg Gly
725 730 735

Met Gln Gly Glu Gln Gly Ala Thr Gly Leu Pro Gly Ile Gln Gly Pro
740 745 750

Pro Gly Arg Ala Pro Thr Asp Gln His Ile Lys Gln Val Cys Met Arg
755 760 765

Val Val Gln Glu His Phe Val Glu Met Ala Ala Ser Leu Lys Arg Pro
770 775 780

Asp Thr Gly Ala Ser Gly Leu Pro Gly Arg Pro Gly Pro Pro Gly Pro
785 790 795 800

Pro Gly Pro Pro Gly Glu Asn Gly Phe Pro Gly Gln Met Gly Ile Arg
805 810 815

Gly Leu Pro Gly Ile Lys Gly Pro Pro Gly Ala Leu Gly Leu Arg Gly
820 825 830

Pro Lys Gly Asp Leu Gly Glu Lys Gly Glu Arg Gly Pro Pro Gly Arg
835 840 845

Gly Pro Lys Gly Leu Pro Gly Ala Ile Gly Leu Pro Gly Asp Pro Gly
850 855 860

Pro Ala Ser Tyr Gly Lys Asn Gly Arg Asp Gly Glu Gln Gly Pro Pro
865 870 875 880

Gly Val Ala Gly Ile Pro Gly Val Pro Gly Pro Pro Gly Pro Pro Gly
885 890 895

Pro Pro Gly Phe Cys Glu Pro Ala Ser Cys Thr Leu Gln Ser Gly Gln
900 905 910

Arg Ala Phe Ser Lys Gly Pro Asp Lys
915 920